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Summary of Rainbow Trout Co-op Angler Data Collected in 2009

Upper Great Lakes Management Unit

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Acknowledgement

The Lake Superior Co-Operative Angler Sampling Program would not be possible without the volunteer efforts and financial support of the North Shore Steelhead Association.

The Co-operative Angler Sampling Program (hereafter referred to as 'the Co-op Program') was originally initiated in 1991 as a three year partnership between the North Shore Steelhead Association (NSSA) and the Ontario Ministry of Natural Resources (MNR), to assess the health of rainbow trout (*Oncorhynchus mykiss*) populations in Canadian tributaries of Lake Superior. The original program generated over 3000 samples from 58 tributaries, and was essential to the review and revision of angling regulations for rainbow trout in Lake Superior and its tributaries. Changes to the regulations were made in 1996 and 1999. Findings of the 1991-1994 Co-op Program are summarized in George (1994) and MacCallum et al (1994).

The findings of the original Co-op Program were also used by the Rainbow Trout Working Group to establish targets for rainbow trout tributaries across the lake:

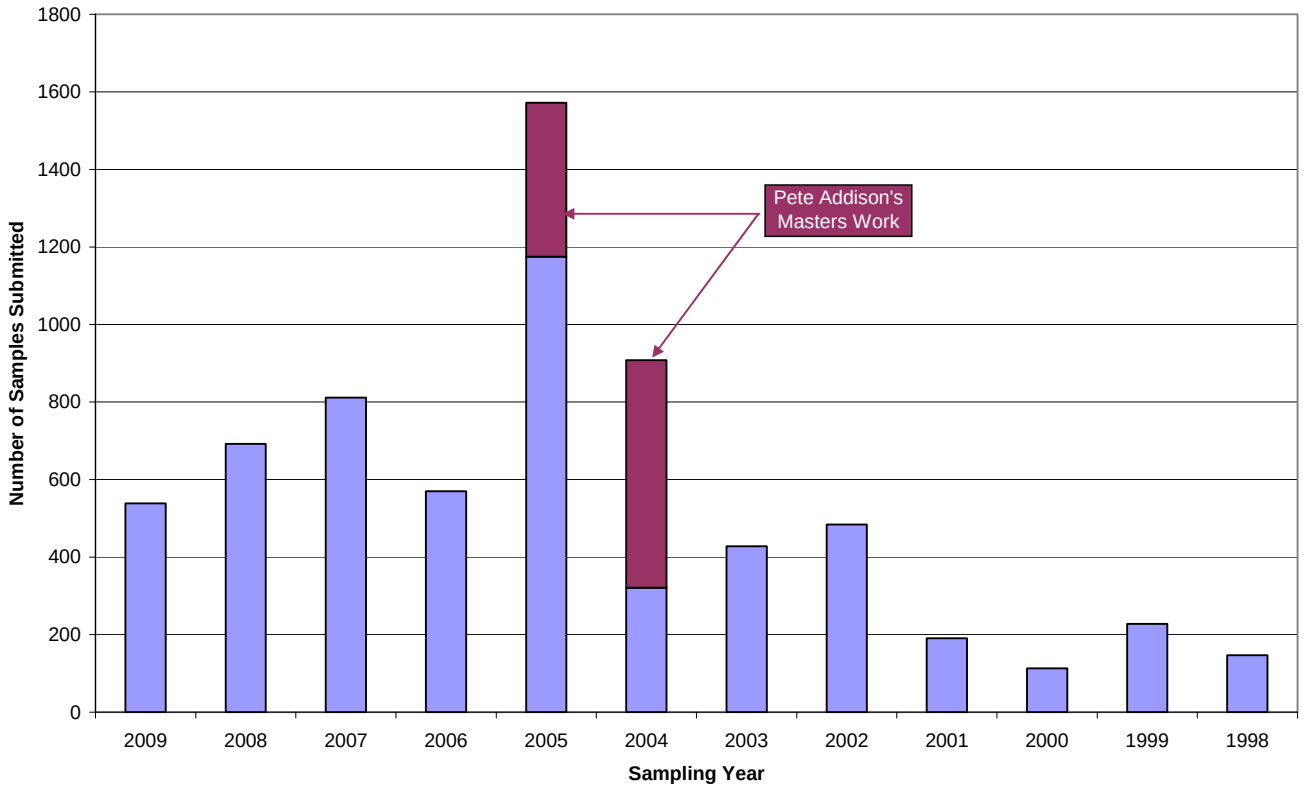
- Maintain a wide range of year classes
- Ensure each of three year-classes represent 15% or more of the adult population
- Maintain a high percentage of repeat spawners (greater than 55%) in rainbow trout populations
- Ensure that there are trophy or large fish (>65 cm fork length) in rainbow trout populations

The Co-op Program was re-established in 1998, as a tool to evaluate the success of the regulation changes. The results of the 1998-2004 surveys are summarized in MacIntosh (2005); since 2005, the Upper Great Lakes Management Unit has produced annual summaries.

Participation in the program has varied since its inception in 1991; at its peak, several angling clubs were involved, with samples being submitted from tributaries all over the Canadian side of Lake Superior. Today, NSSA is the sole partner in the program, and sampling has been concentrated in the western tributaries (i.e. west of Marathon). Figure 1 illustrates the total number of samples submitted to the Co-op Program in each year since its reactivation in 1998; figure 2 illustrates the total number of tributaries sampled each year. While these figures cannot be taken as an accurate measure of effort, they do provide a gross indication of interest and participation in the program over the course of twelve fishing seasons.

The 2009 Co-op Program included samples from eighteen tributaries. As in previous years, a minimum sample size of forty individuals is required to permit an adequate assessment of any single tributary; in 2009, only the Cypress, Jackpine, McIntyre and Prairie Rivers achieved this minimum sample size. Figure 3 shows the total number of samples submitted for each of the tributaries in 2008 and 2009; detailed information on the four aforementioned tributaries is presented in the results section.

Figure 1: Co-Op Angler Sampling Program - Total Number of Samples (All Tributaries) 1998-2009



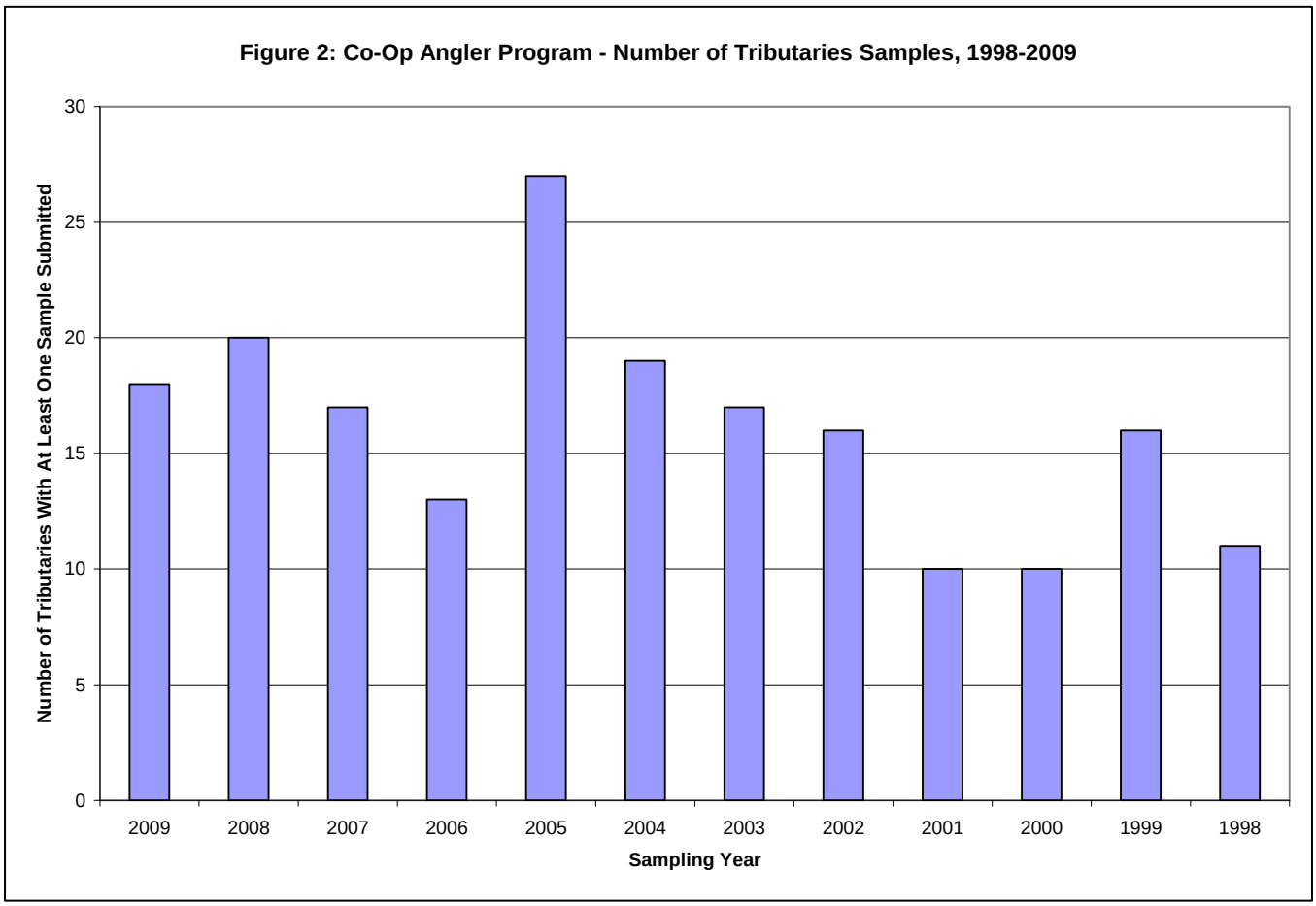


Figure 2: Co-Op Angler Program - Number of Tributaries Samples, 1998-2009
Number of Tributaries With At Least One Sample Submitted
30
25
20
15
10
5
0
2009
2008
2007
2006
2005
2004
2003
2002
2001
2000
1999
1998
Sampling Year

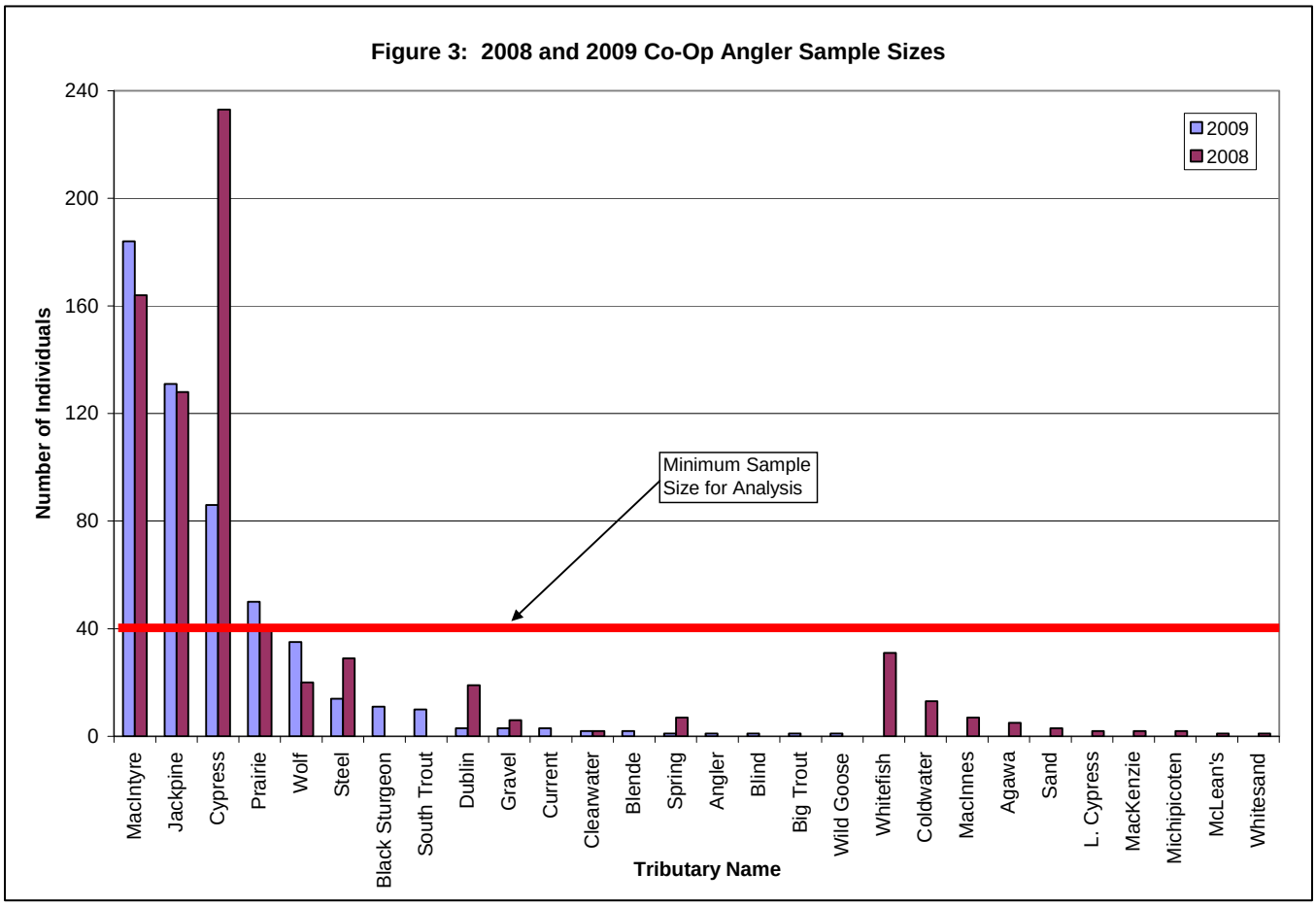


Figure 3: 2008 and 2009 Co-Op Angler Sample Sizes
Number of Individuals
240
200
160
120
80
40
0
2009
2008
Minimum Sample Size for Analysis
MacIntyre
Jackpine
Cypress
Prairie
Wolf
Steel
Black Sturgeon
South Trout
Dublin
Gravel
Current
Clearwater
Blende
Spring
Angler
Blind
Big Trout
Wild Goose
Whitefish
Coldwater
MacInnes
Agawa
Sand
L. Cypress
MacKenzie
Michipicoten
McLean's
Whitesand
Tributary Name

Results

Explanation of the parameters measured in the study

(adapted from McCallum et al 1994)

Length Distribution

A summary of the length distribution of the catch is shown in this figure. As a quick index of the status of the stocks a wide range in the length distribution in the catch is a good sign. The length distribution is also useful in evaluating the success of size limits in protecting the bulk of spawning fish (e.g. McIntyre River)

Age Class Distribution

Year class strength is thought to be controlled by environmental conditions such as amount of rain, water levels and temperatures, more than by the number of spawners. Larger streams probably have less variation than small ones. The graph allows strong year-classes to be identified, which affects estimates of repeat spwaners. A wide range of year classes in the catch is an indicator of a healthy population.

Number of Spawns by Sex

This graph shows the percentage of repeat spawners in the catch. The percentage of repeat spawners is equivalent to an estimate of annual survival, provided annual survival and recruitment of "maiden" fish to the spawning population are relatively constant. This statistic is the single most important one for judging the health of the stock. As a rule of thumb we use 50% as a critical value; populations with >50% repeat spawners are generally healthy, whereas <50% may indicate problems.

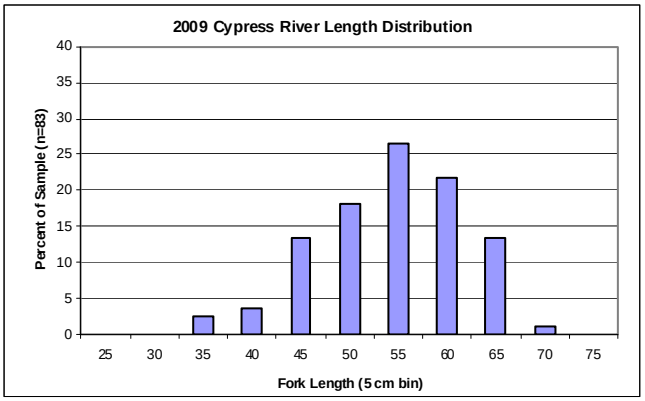
Stream Years

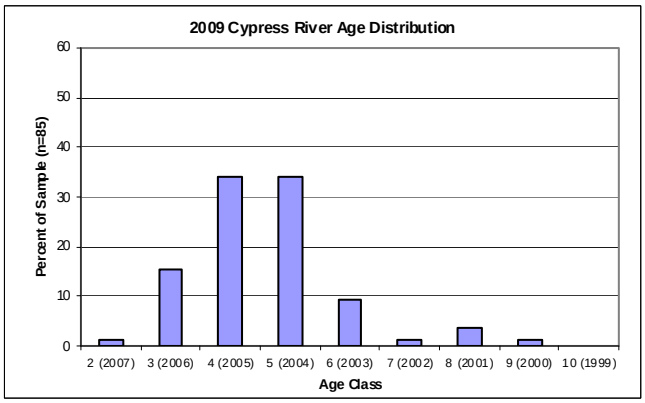
The number of years a rainbow trout spends in the stream is mainly a stream-specific trait. Streams can produce a greater number of smolts if the fish migrate to the lake after one year, than after two years; however, age two smolts are usually larger and have better survival rates than fish from the same stream that smolted after one year. The graph represents the number returning to spawn — not necessarily the proportion that smolt at a given number of stream years.

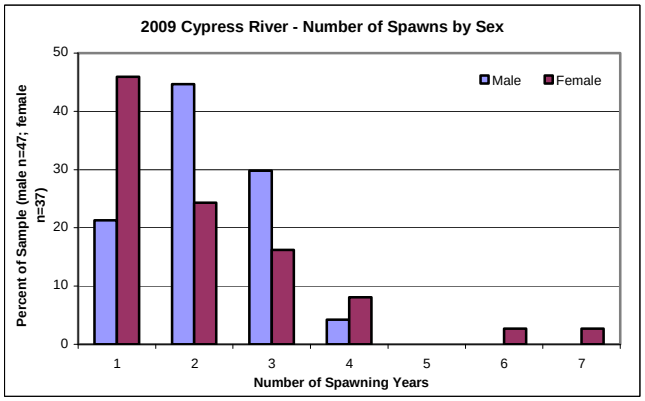
Lake Years at Maturity

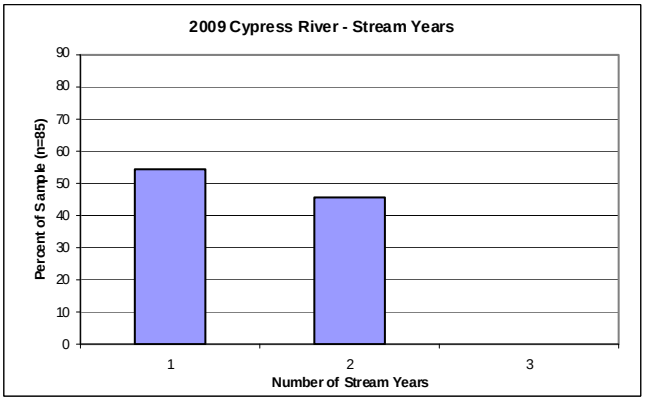
This graph illustrates the distribution of the number of years spent in the lake before the fish return to the stream to spawn for the first time. Because there are differences between males and females in this attribute, they are shown separately. Healthy populations tend to mature later (two or more lake years), allowing fish to put more energy into growth, which in turn increases the reproductive capacity and survival potential once the fish become mature.

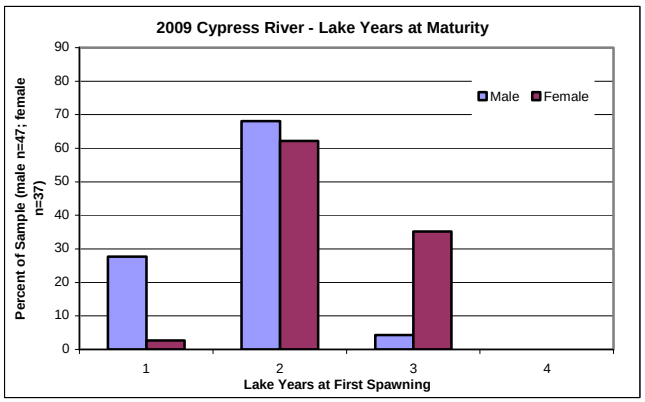
Cypress River







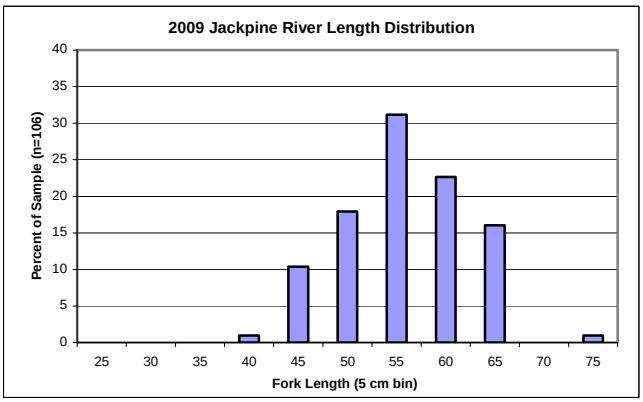


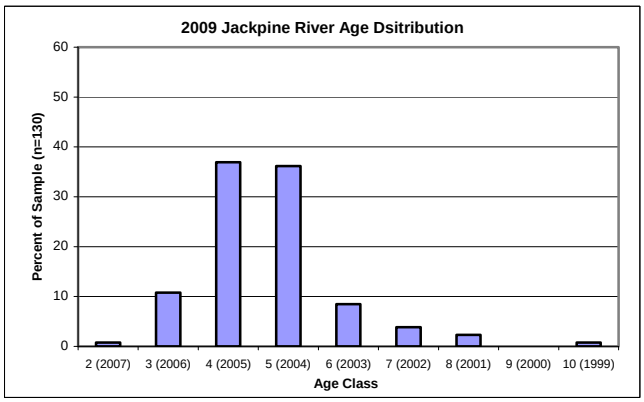


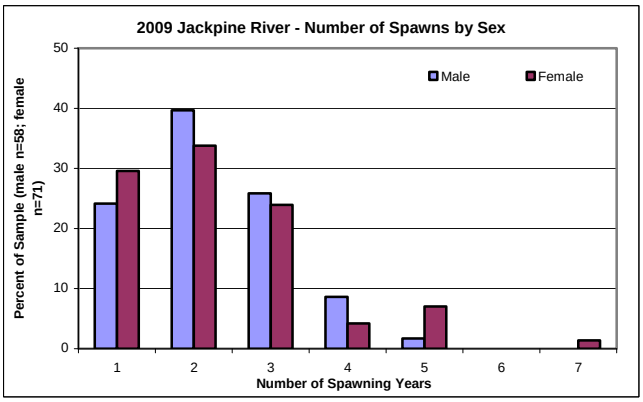
Total Catch	86
Males Sampled	48
Females Sampled	37
Unknown sex	1
Mean fork length (cm)	541.7
Maiden Spawners (%)	32.94
Repeat Spawners (%)	67.06

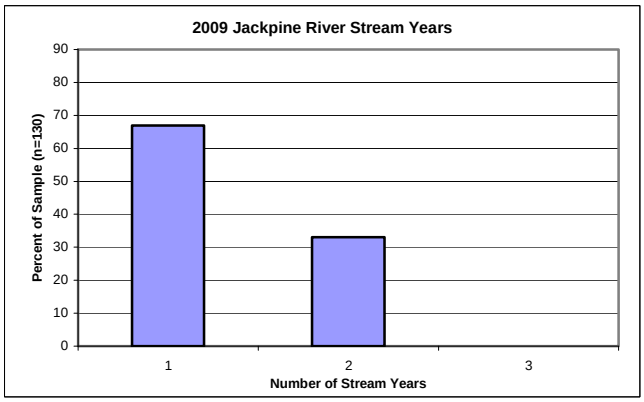
All parameters indicate that the Cypress River is supporting a healthy population of rainbow trout.

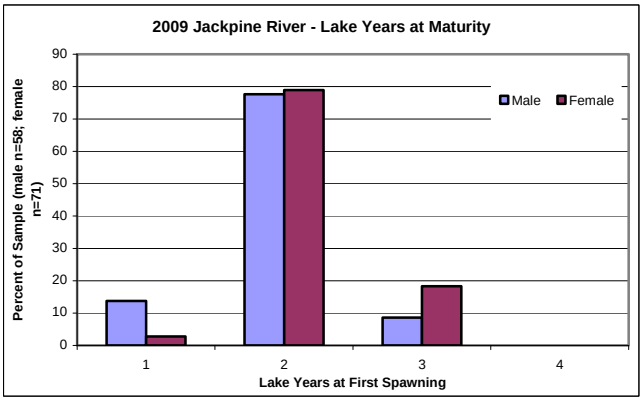
Jackpine River







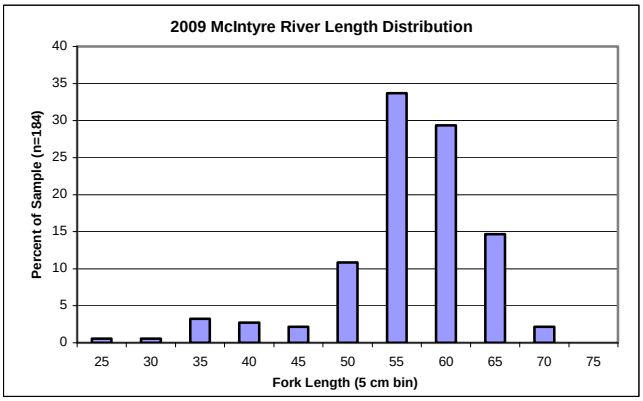


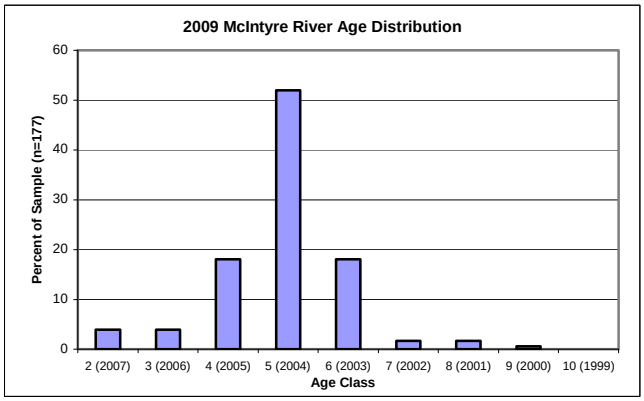


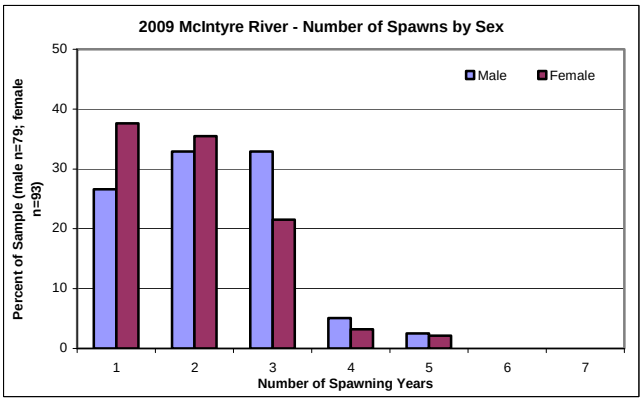
Total Catch	131
Males Sampled	59
Females Sampled	71
Unknown sex	1
Mean fork length (cm)	559
Maiden Spawners (%)	27.69
Repeat Spawners (%)	72.31

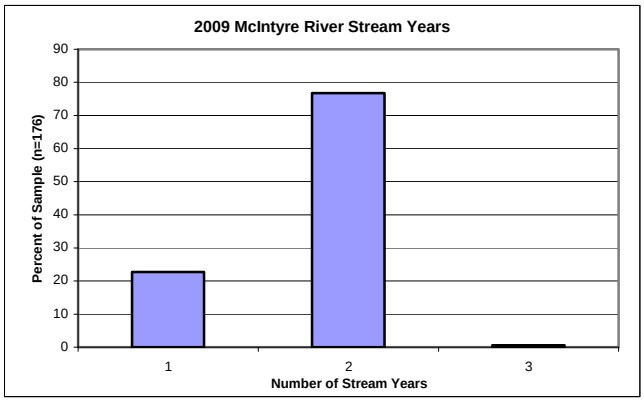
All parameters indicate that the Jackpine River is supporting a healthy population of rainbow trout.

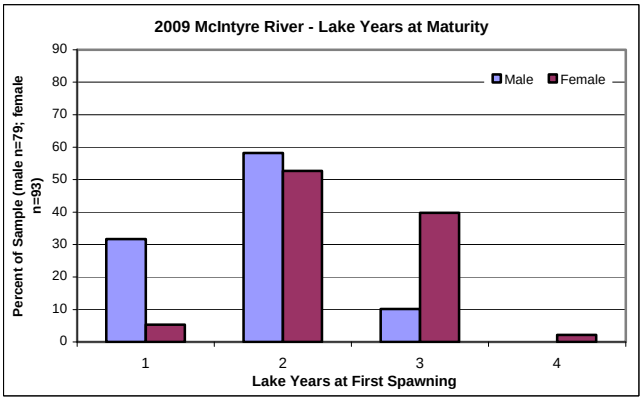
McIntyre River









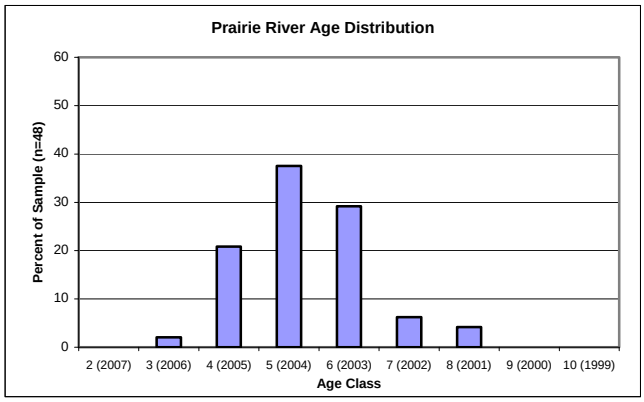


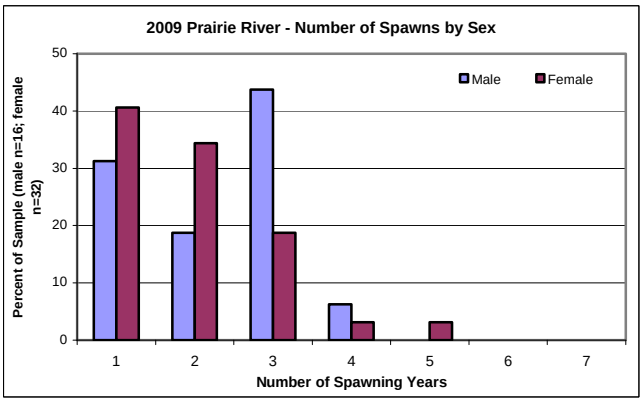
Total Catch	184
Males Sampled	83
Females Sampled	96
Unknown sex	5
Mean fork length (cm)	560
Maiden Spawners (%)	34.09
Repeat Spawners (%)	65.91

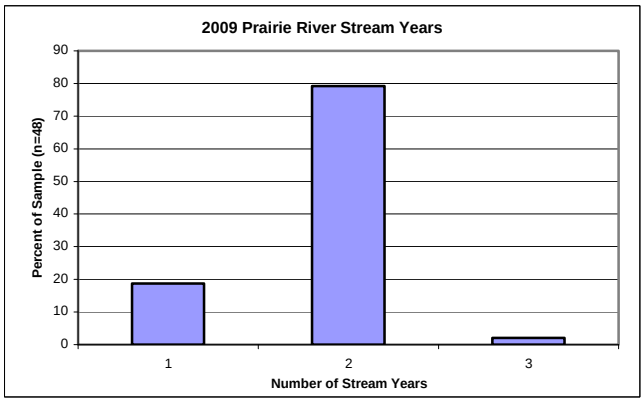
All parameters indicate that the McIntyre River is supporting a healthy population of rainbow trout. The number of age 3 and 4 individuals was disproportionately low compared to the Cypress and Jackpine Rivers; this may be due to a particularly strong 2004 year class, or a weak 2005 year class in the McIntyre.

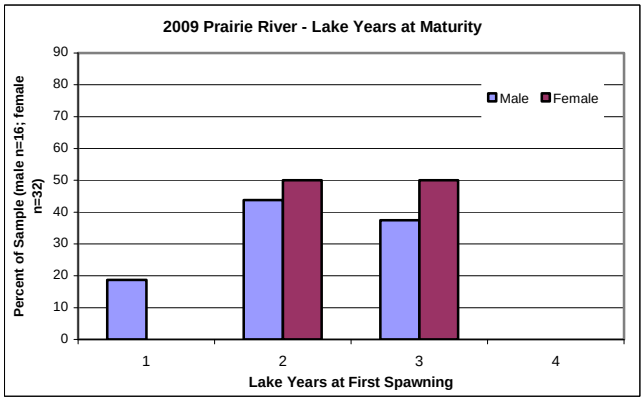
Prairie River

No length data was recorded on the Prairie River in 2009.









Total Catch	50
Males Sampled	17
Females Sampled	33
Unknown sex	0
Mean fork length (cm)	N/A
Maiden Spawners (%)	37.5
Repeat Spawners (%)	62.5

All parameters indicate that the Prairie River is supporting a healthy population of rainbow trout.

McIntyre River Mark-Recapture Study

The McIntyre River Mark-Recapture Study is a new sub-component of the Co-op Program that was initiated in the 2008 field season. In addition to their regular duties as Co-op Program volunteers, six NSSA members concentrated their efforts on the McIntyre River, applying an adipose (AD) clip to all fish they captured; this comprised 147 of the 164 fish sampled on the McIntyre in 2008.

2009 was the first recapture year in the program; the six specified anglers monitored rainbow trout caught in the McIntyre River for adipose clips from 2008. All rainbows captured in 2009 were marked with a right ventral (RV) clip for monitoring in 2010.

Population Estimate

The 2008 population of reproducing rainbow trout in the McIntyre River was estimated using the Petersen formula (Robson and Regier 1964):

$$\hat{N} = \frac{MC}{R}$$

where M is the number marked and released (in 2008)
C is the number subsequently examined for marks (in 2009)
R is the number of marks found in the sample C
$\hat{N}$ is the Petersen estimate of population size

Variance of $\hat{N}$ was calculated using the following formula:

$$\hat{V}(\hat{N}) = \hat{N}^2 \frac{(\hat{N} - M)(\hat{N} - C)}{MC(\hat{N} - 1)}$$

where $\hat{V}(\hat{N})$ is the variance of the Petersen estimator

The 95% confidence interval for $\hat{N}$ calculated using the following formula:

$$\hat{N} \pm 1.96\sqrt{\hat{V}(\hat{N})}$$

Results

M - Total number of fish marked (AD) in 2008: 147
C – Total number of repeat spawners in 2009: 100
R - Total number of recaptures in 2009: 11

Total number of fish marked (RV) in 2009 (for recapture in 2010): 162

The Peterson population estimate for spawning rainbow trout in the McIntyre river in 2008 is:

1336 ± 717 (p=0.05)

Limitation

The Petersen method assumes that the study population is "closed."; that the mark and recapture events are close enough in time so that no individuals die, are born, move into the study area (immigrate) or move out of the study area (emigrate).

Using the Petersen method on an open system such as the McIntyre, with a full year between the mark and recapture events, may limit the accuracy of the estimate.

References

George, J. 1994. The status of rainbow trout (*Oncorhyncus mykiss*) in the Canadian waters of Lake Superior based on frequency of repeat spawners 1991-1993. OMNR LSMU Rpt. 28 p.

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